CHAPTER – 1 INTRODUCTION

The manufacturing industries in the world have undergone a tremendous change in the last three decades. Due to this there have been drastic changes in management approach, techniques used in production and process, expectations of customer, attitudes of supplier, as well as competitive behaviour (Ahuja et al., 2006). In the highly dynamic and rapidly changing modern era, the global competition among organizations has lead to higher expectations from the manufacturing organizations (Miyake and Enkawa, 1999). The global marketplace has witnessed an increased pressure from customers and competitors in manufacturing as well as service sector (Basu, 2001; George, 2002).

Due to the rapidly changing global marketplace, only those companies will be able to survive that deliver products of good quality at cheaper rate and to achieve their goal companies try to improve performance by focusing on cost cutting, increasing productivity levels, quality and guaranteeing deliveries in order to satisfy customers (Raouf, 1994). Slow and steady improvements in manufacturing operations do not guarantee sustained profitability or survival of an organization in this fast-changing marketplace (Oke, 2005). Thus, if the organizations are to become or remain leader, it need to change strategies, improve product quality and reduce cost of production at a faster rate than their competitors.

Increased global competition has led the industry to enhance efficiency by means of economies of scale and internal specialisation so as to meet market conditions in terms of flexibility, delivery performance and quality (Yamashina, 1995). The changes in the present competitive business environment have been characterised by profound competition on the supply side and heightened fickle in customer requirements on the demand side. These changes have left their unmistakable marks on the different aspect of the manufacturing organizations (Gomes et al., 2006). With this increasing global economy, cost effective manufacturing has become a requirement to remain competitive.

To meet all the challenges organizations try to introduce different manufacturing techniques. Management of organizations devote their efforts to reduce the manufacturing costs and to improve the quality of product. To achieve this goal,
different manufacturing techniques have been employed. The last quarter of the 20th century has witnessed the emergence of three major programmatic operations improvement concepts that have drastically changed the way manufacturing firms manage their operations. The significant management initiatives adopted in the last decade include just-in-time (JIT) production systems, International Standards Organization (ISO) 9000 certifications and total quality management (TQM) (Dreyfus et al., 2004, Mishra et al., 2012).

1.1 **Evolution of JIT**

In the early times, firms used to keep inventories to meet their future requirements and the authors have justified keeping inventory in the store. According to Khanna (1997), inventory is the items of stores or material kept in stock to meet future demand of production, repair, maintenance, construction, etc. It has been envisaged that inventory is needed as they help in smooth and efficient running of enterprises. There are various types of inventory that are kept in the industry. Some of these are raw material inventories, work-in-process and finished goods inventories. Raw material inventories are inputs that get converted to final output. These items are critical in nature, as any breakdown in supply results in production stoppage. The inventory levels are usually decided taking into consideration various factors such as origin – local or imported; availability – regular or seasonal; government regulations (if any). Work-in-process inventories are materials in intermediate stage, whereas finished goods inventory acts as a cushion between the production and the sales department.

Keeping of inventory increases cost of product and reduces profits of any industry. Industries tried to control their inventory levels from the early times so as to reduce the cost of product and to enhance profits. Some features of different inventory classification techniques used to control inventories are listed in Table 1.1.

Shortcomings of the inventory control techniques in the past has affected the global competition of an organization to a great extent, thereby reducing the throughput and reliability of production facilities, leading to fast deteriorations in production facilities, lowering equipment availability, lowering quality of production, increasing inventory levels, increasing cost of product, increasing waste thereby leading to unreliable delivery performance (Ahuja and Khamba, 2008).
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In this era of competition, only those companies will be able to survive that will deliver products of good quality at cheaper rate. Companies try to keep their edge over the other company to survive and in the ’70s, the Japanese were the ones who
dominated the world market by providing cheap and quality products. Drucker (1971) was the first academic who recognised that Japan was a country from which Western companies could learn.

The oil crisis in 1973, led to decline in economic growth and decline in profitability of many companies. Due to this decline Japanese manufacturers started to think about the methods to reduce the cost of their products, without compromising on quality and by using existing financial resources, so that they can come out of financial crises. JIT has been envisaged as one of the strategic management initiatives evolved by Japan’s manufacturers to produce good quality products at low price. The JIT process has been primarily applied to the manufacturing industry. But nowadays JIT can be used in any type of organization.

1.2 History of JIT

World market has been dominated by Japanese products in 1990’s. The success of Japanese has, in turn, led Western manufacturers to examine Japanese manufacturing practices and, in many cases, attempt to emulate them (Keller and Kazazi, 1993). Drucker (1971) was the first academic who recognized that Japan was a country from which Western companies could learn. Many articles about Japanese management, production system, manufacturing, and culture have been published since 1970’s to emphatically justify optimum utilization of resources to meet global competition. Most of these articles have paid attention only to socio-cultural environment and general management practices of Japanese.

Oil crisis of 1973 caused many industries to recognize their needs for a new approach to control declining economic growth through international competition. The oil crisis created a major decline in profitability for Japanese manufacturers, who compensated for this by employing methods to improve productivity and reduce the costs of products without excessive additional capital investment (Keller and Kazazi, 1993). Many researchers have concluded that Japanese manufacturing management techniques are among the several factors which have contributed to the Japanese reputation for superior product quality and their high growth in productivity. ‘Just-in-Time’ manufacturing is one of the Japanese production management systems best known to management in Western industry.
The basic concept of Just-in-Time (JIT) was first introduced by Taiichi Ohno, executive Vice-President of the Toyota Motor Company. His ideas were formalized into a management system when Toyota envisaged to meet the precise demands of customers for various models and colours of car with minimum delay (Amasaka, 2013). Toyota started to implement JIT in the early 1970s and it then spread to other Japanese companies in the late 1970s. By the early 1980s, JIT became a very popular manufacturing innovation in Western and Asian countries (Schonberger, 1982a).

Just-in-Time systems (JIT) attributes have also been successfully adopted in the USA under several different names, such as ZIPS (Zero Inventory Production System) by Omark Industries, MAN (Material as Needed) by Harley Davidson, MIPS (Minimum Inventory Production System) by Westinghouse, Stockless Production by Hewlett-Packard, and Continuous Flow Manufacturing by IBM (Antonio and Egbelu, 1991). The JIT philosophy embraces all aspects of manufacturing with a central focus of ensuring that the needed items or required quality are available in the precise quantity at the right time in the right place. In a sense, JIT production aims to make a variety of products with the shortest lead times, lowest cost, highest quality and minimum possible mistakes in production. This philosophy involves a set of innovative manufacturing strategies which can provide the basis of synchronous manufacturing systems. Underpinning the entire philosophy of JIT is a series of important factors which include facility layout, product design, production planning and scheduling (Chung and Choi, 2013), purchasing, material flow and the usage of human resources.

1.3 Definitions of JIT

Over the last two decades Just-in-Time (JIT) manufacturing has received widespread attention. The first article regarding JIT in manufacturing appeared in the late 1970s. After that many authors defined JIT in different ways. Few definitions of JIT are listed below:

Schonberger (1982a) has defined JIT as to produce and deliver finished goods Just-in-Time to be sold, sub assemblies Just-in-Time to be assembled into finished goods, fabricated parts Just-in-Time to go into the sub assemblies and purchased materials Just-in-Time to be transformed into fabricated parts.
APICS (1987) has defined JIT in the broad sense, an approach to achieving excellence in a manufacturing company based on the continuing elimination of waste. In the narrow sense, Just-in-Time refers to the movement of material at the necessary place at the necessary time.

Potts (1986) has defined JIT as philosophy directed towards the elimination of waste, where waste is anything which adds cost but not value to a product.

Hunglin and Wang (1991) claimed that Just-in-time production as a philosophy that calls for reducing work in progress (WIP) inventory to aid process improvement and reduce process variability.

1.4 Overview of JIT Paradigms

The Indian economic reforms begin in the 1990s (Singh and Ahuja, 2012). Due to this various global manufacturing organizations got attracted towards one of the world’s largest markets like India. This drastic transition from licence raj (permit regime) to global competition compelled the Indian manufacturing industry to think towards improving its competitiveness by upgrading productivity and the quality of products, reducing costs of product and offering more varieties with improved services and enhanced quality (Bhadury and Mandal, 1998). Due to this, many manufacturing organizations have been compelled to imbibe various proactive management initiatives like lean manufacturing, to attain world class practices through various business solutions, but the most widely accepted amongst those are TQM, JIT and TPM (Sahay et al., 2000).

JIT has been considered one of the strategies to enhance manufacturing performance by taking up of world-class, lean and integrated manufacturing strategies (Fullerton and McWatters, 2002). JIT issues have to be considered as an important issue for manufacturing industries to create world-class manufacturers (Brah and Chong, 2004). Just-in-time (JIT) has been depicted as a manufacturing system where required parts to complete finished products are produced or delivered at the assembly site as and when needed (Wafa and Yasin, 1998). It has been defined as a method to attaining excellence in a manufacturing organization based on continuous elimination of waste and steady improvement in productivity. A main point in understanding JIT is the continuous monitoring of production processes with the aim of eliminating all types of
waste (Wafa and Yasin, 1998). Quality has been envisaged as a significant factor in JIT manufacturing so that there should be zero defects or in other words ‘get it right the first time. In a JIT environment quality of products should be such that no inspection should be required (Aghazadeh, 2003). Horngren and Foster (1987) have listed four cardinal objectives of JIT as shown in Figure 1.1

![Objectives of JIT](Image)

**Figure 1.1 Objectives of JIT**

‘Just-in-time’ has been accepted as a management philosophy and not a technique. It originally referred to the production of goods to meet customer demand exactly, in time, quality and quantity, whether the ‘customer’ is the final purchaser of the product or another process further along the production line.

JIT has been accepted as a manufacturing philosophy targeting to achieve production with minimum waste. ‘Waste’ is taken in its most general sense and includes time and resources as well as materials. The key elements of JIT philosophy include:

- Continuous improvement.
  - Attacking fundamental problems - anything that does not add value to the product.
• Devising systems to identify problems.

• Striving for simplicity - simpler systems may be easier to understand, easier to manage and less likely to go wrong.

• A product oriented layout produces less time spent moving of materials and parts.

• Quality control at source - each worker is responsible for the quality of their own output.

• Poka-yoke - ‘foolproof’ tools, methods, jigs etc. prevent mistakes.

• Preventative maintenance, Total productive maintenance - ensuring machinery and equipment functions perfectly when it is required, and continually improving it.

• Eliminating waste. There are seven types of waste:
  
  o Waste from overproduction.
  
  o Waste of waiting time.
  
  o Transportation waste.
  
  o Processing waste.
  
  o Inventory waste.
  
  o Waste of motion.
  
  o Waste from product defects.

• Good housekeeping - workplace cleanliness and organisation.

• Set-up time reduction - increases flexibility and allows smaller batches. Ideal batch size is 1 item.

• Multi-process handling - a multi-skilled workforce has greater productivity, flexibility and job satisfaction.

• Levelled / mixed production - to smooth the flow of products through the factory.

• Kanbans - simple tools to ‘pull’ products and components through the process.
Jidoka (Autonomation) - providing machines with the autonomous capability to use judgment, so workers can do more useful things than standing watching them work.

Some of the benefits of JIT allow companies to reduce worker’s dissatisfaction, to reduce cost of products, to meet customer’s demands, stay ahead of competitors and minimise weak resources which are critical for survival in the highly competitive market (Cobb, 1993). JIT leads to production of low-cost, enhanced quality goods and it also helps in achievement of best results through continuous improvements in the business activities by redefining the structural and procedural activities to be performed within an organization. To attain this, constant monitoring of the changes in quality of products, reduction of setup times, defects in products, rework, and throughput time is vital.

1.5 Need for Present Study

The literature review indicates that JIT philosophy has been deployed by more and more organizations as a tool for increasing employ effectiveness, equipment effectiveness and cost optimization in order to attain core competitiveness. In India, the industry has been trying everything possible to change from the traditional style of working to highly cost efficient working to be able to compete with the world leaders. Still it does not appear viable to try all the elements of lean manufacturing simultaneously and copying strategies adopted by industry in the developed countries. Rather it is desirable to select an optimum mix of JIT initiatives in the right order and at the right time, in order to derive maximum benefits within the cost constraints and other limitations of the system.

It has also been observed that in the Indian context, the manufacturing Industry is faced with certain inherent difficulties in implementing effective JIT programs. These include worker’s apprehension about work force reduction, overloading due to increased responsibilities, reluctance to changing practices, difficulties to understand business economics, lower skill base of the employees, fear of time shortages for adapting to new state of the art JIT activities, inability to realize the tangible and intangible benefits of JIT implementation, inability to realize the same level of benefits as reported in literature or as reaped by developed countries by imitating the JIT implementation procedures and practices adopted by the western countries. Thus there is an emergent
need to conduct a detailed study on JIT implementation issues in the Indian context in order to develop an indigenous strategic JIT implementation approach for the Indian industry.

1.6 Objectives of the Study

The objectives of the research work are outlined below:

a. Analyzing the JIT initiatives adopted by Indian entrepreneurs for achieving competitive manufacturing.

b. Evaluating the JIT implementation capabilities of Indian Manufacturing Industry.


d. Evolving key success factors for successful JIT implementation Indian Manufacturing Industry.

1.7 Scope of Work

JIT being much in vogue in Indian manufacturing, a need is felt to examine the efficacy of these JIT management practices. An investigation into this issue will help answering some vital questions on implementation of the JIT practices towards manufacturing performance enhancement in Indian context. The major objectives of this research are to examine the effectiveness of JIT to improve business performance of Indian manufacturing organizations.

The study has been carried out in the medium and large scale manufacturing organizations in the country that have implemented or are in the process of implementing JIT and to study JIT implementation issues and key benefits achieved as a result of JIT implementation. The approach has been directed towards justification of JIT implementation for its support to competitive manufacturing in Indian Manufacturing Industries. In addition the status of manufacturing industry, with regard to JIT practices used and the JIT implications has been investigated.
1.8 Overview of Dissertation

The dissertation has been organized into seven chapters. This section provides a brief description of each of these chapters.

Chapter 1 highlights the significance of JIT implementation towards improving the manufacturing performance. Moreover the chronological developments in the JIT function have been emphasized in this chapter.

Chapter 2 provides a detailed literature review on JIT implementations and its development relevant to this study. The literature has been analyzed and the contributions of JIT initiatives towards improving manufacturing performance and realization of core competencies have been elaborated and Indian entrepreneurs have been elaborated. Also the stumbling blocks and success factors for JIT Implementation has been elaborated in this chapter.

Chapter 3 elaborates design of the study has been emphasized and the methodology adopted for analyzing and synthesizing the collected information through the questionnaire and case study have been depicted.

Chapter 4 depicts the detailed analysis of information obtained through the questionnaire to ascertain the JIT manufacturing implications of the Indian Manufacturing Industry. Appropriate qualitative and quantitative techniques have been employed to analyze the relationship between JIT manufacturing attributes and manufacturing performance through successful JIT implementation.

Chapters 5 authenticates the data obtained through questionnaire. The case study has been conducted in the key manufacturing units highlighted by the analysis of the questionnaire. The case study has been conducted to ascertain the step-by-step JIT implementation procedure adopted by the organizations towards achieving the organizational objectives.

Chapter 6 presents the inferences drawn from literature, empirical study carried out in Indian manufacturing industry and case study conducted in the manufacturing organizations. The inferences drawn from the survey and case study have been synthesized to evolve critical success factors for strategic JIT implementation for Indian Manufacturing industries. The SWOT analysis of JIT implementation in Indian industries has also been presented.
Finally in Chapter 7, the critical learning issues of the study have been summarized. In view of the insight gained, the action for the JIT implementation in the manufacturing organization has been recommended. The conclusions derived from the synthesis of the data in a sequential manner have been presented, limitations of the study have been highlighted and scope for the future work has also been suggested.